Evaluation of the PhD Thesis of – Influence of functionalized nanoparticles of different sizes, materials, and surface properties on cellular machinery – Mariia Uzhytchak

In her work Ms. Uzhytchak contributes to the field of nanomedicine, showcasing an impressive breadth and depth of research. The work has resulted in eight publications in indexed peer-reviewed journals, several conference contributions, and lectures, underscoring its significance and impact.

This interdisciplinary endeavor effectively merges pharmaceutical sciences, cell biology, engineering, chemistry, and materials science. Such integration is crucial for fostering innovation, despite the inherent challenges in translating nanomedicines to clinical applications due to varying methodologies and focus areas. The research provides valuable insights into the interactions between nanoparticles and cellular systems, particularly the internalization of nanoparticles through endocytic pathways and their localization in lysosomes.

One of the standout aspects of this thesis is the detailed examination of the fate of nanoparticles and their influence on lysosomal degradation, which is highly relevant to in vivo biomedical applications. The investigation into the hepatic accumulation of iron oxide nanoparticles and their interaction with liver cells reveals a complex interplay of biological processes, highlighting potential hepatotoxicity concerns. The research underscores the liver's critical role in nanoparticle metabolism, emphasizing the need for thorough exploration of hepatotoxicity in nanomedicine research.

The thesis also addresses a significant gap in understanding the role of lysosomal dysfunction in adverse drug reactions associated with nanomedicines. This area, often overlooked, is crucial for ensuring the safety and efficacy of nanotherapeutics. By focusing on the interaction between nanomedicines and altered lysosomal functions in disease states, the thesis paves the way for future investigations that could lead to safer and more effective treatments.

In conclusion, this thesis is a significant contribution to the field of nanomedicine, advocating for a more integrated, biology-focused approach in the design and development of nanotherapeutics. It highlights the importance of interdisciplinary collaboration and a deeper understanding of biological interactions to overcome the challenges in clinical translation. The emphasis on scientific rigor, ethical research

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practices, and patient safety underscores the thesis's commitment to advancing the field responsibly. This comprehensive and innovative research sets a high standard for future studies in nanomedicine.

Overall, I evaluate the submitted dissertation as excellent; and I strongly recommend it for defense.

Sincerely,

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